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ACCURACY AND QUICKNESS CRITERION-BASED DRIVING SKILL METRIC FOR HUMAN ADAPTIVE MECHATRONICS SYSTEM

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A thesis submitted in fulfilment of the
requirements for the award of the degree of
Master of Engineering (Electrical)

Faculty of Electrical Engineering
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NOVEMBER 2015

To my beloved mother and my family ☺

ACKNOWLEDGEMENT

In preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I wish to express my sincere appreciation to my main thesis supervisor, Dr Mohamad Hafis Izran bin Ishak, for encouragement, guidance, critics and friendship. I am also very thankful to my co-supervisors Dr Mohamed Sultan bin Mohamed Ali for his guidance, advices and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Ministry of Education (MoE) and Majlis Ugama Islam Pahang (MUIP) for funding my Master study. Librarians at UTM deserve special thanks for their assistance in supplying the relevant literatures.

My fellow postgraduate students should also be recognised for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am also grateful to my mother and all my family members.

ABSTRACT

Current research is focusing on understanding the driver in order to develop a car driving support system. The car driving support systems must rely on a reliable driving skill algorithm in order to provide optimal support. Previous studies on skill algorithm have combined tracking error and time related variable into algorithm formulation. This method however does not include a car orientation and lateral speed information as an integral part of the algorithm. Two new variables are introduced into the algorithm structure, namely, orientation angle and lateral speed. Nine participants were carefully recruited for a driving test to validate the algorithm. A simulated driving environment was specifically devised for this experiment. A driving track used in this experiment was segmented into five different severities for data analysis. Two fundamental goals have led to the collection of the data and the subsequent data analysis. The first is analysing the variables in relation to the driving task. The second involves data analysis being further extended into analysing the algorithm performance over estimating the driving skill index. The results reveal that the proposed variables are well correlated with the driving task, and improvement in algorithm performance is found to be almost double compared to previous algorithm.

ABSTRAK

Kajian penyelidikan terkini menumpukan perhatian kepada memahami pemandu bagi membina sistem sokongan pemanduan. Sistem sokongan pemanduan kereta perlu bergantung kepada algoritma kemahiran pemanduan yang boleh dipercayai bagi memastikan sokongan yang optimum. Kajian terdahulu telah menggabungkan ralat penjejakan dan pembolehubah yang berkaitan dengan masa ke dalam formulasi algoritma. Kaedah tersebut bagaimanapun tidak mengambil kira orientasi dan kelajuan sisi kereta sebagai sebahagian daripada formulasi algoritma tersebut. Dua pembolehubah baru diperkenalkan ke dalam struktur algoritma, iaitu sudut orientasi dan kelajuan sisi kereta. Sembilan peserta telah dipilih dengan teliti bagi menjalani ujian pemanduan untuk mengesahkan algoritma. Persekitaran simulasi pemanduan telah dibina secara khusus untuk eksperimen ini. Trek memandu yang digunakan dalam eksperimen ini telah dibahagikan kepada lima jenis kesukaran yang berbeza bagi tujuan penganalisisan data. Dua dasar telah membawa kepada pengumpulan dan penganalisisan data. Yang pertama adalah menganalisis pembolehubah berkaitan dengan tugas pemanduan. Yang kedua melibatkan analisis data yang diperluaskan dalam menganalisis prestasi algoritma dengan menganggarkan indeks kemahiran pemandu. Keputusan menunjukkan bahawa pembolehubah yang dicadangkan adalah sangat berhubung rapat dengan tugas pemanduan kereta, dan peningkatan dalam prestasi algoritma didapati hampir dua kali ganda berbanding algoritma sebelumnya.